CLAIMS

What is claimed is:

1 An apparatus for measuring an optical signal to noise ratio (OSNR) for an optical channel radiation having a central wavelength λc and having a noise component having a noise bandwidth and a signal component having a signal bandwidth, said apparatus comprising:

a spectrally selective reflecting element having a reflecting bandwidth disposed to receive the optical channel radiation for reflecting at least a portion of the signal component to form reflected radiation, and for transmitting at least a portion of the noise component to form transmitted radiation;

a first optical detector disposed to receive at least a fraction of the reflected radiation for producing a first information signal indicative of the signal component;

a second optical detector disposed to receive the transmitted radiation for producing a second information signal indicative of the noise component,

optical coupling means for coupling the optical channel radiation into the spectrally-selective reflecting element, and for coupling at least a fraction of the reflected radiation into the first optical detector;

processing means disposed to receive the first information signal indicative of the signal component and the second information signal indicative of the noise component for determining the optical signal to noise ratio.

2 An apparatus for measuring the optical signal to noise ratio as defined in claim 1, wherein the spectrally-selective reflecting element is a fiber Bragg grating (FBG).

3 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the optical coupling means is a bidirectional optical coupler.

4 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the first information signal and the second information signals are electrical signals.

5 An apparatus for measuring the optical signal to noise ratio as defined in claim 4, wherein the processing means comprise a suitably programmed microprocessor for determining the OSNR.

6 An apparatus for measuring the optical signal to noise ratio as defined in claim 5, wherein the processing means include a look-up table for determining the OSNR from the first information signal and the second information signal.

7 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the first optical detector is for monitoring optical power of the signal component.

8 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the second optical detector is for monitoring optical power of the noise component.

9 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, said apparatus operable for real-time monitoring of at least one of: the OSNR, an optical power of the signal component, an optical power of the noise component.

10 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the fiber Bragg grating has a reflection band, and wherein the reflection band is centered substantially about λc.

11 An apparatus for measuring the optical signal to noise ratio as defined in claim 10, wherein the noise bandwidth is greater than the signal bandwidth.

12 An apparatus for measuring the optical signal to noise ratio as defined in claim 11, wherein the reflecting bandwidth is at least as large as the signal bandwidth and smaller than the noise bandwidth.

13 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein a substantial portion of the noise component is due to amplified spontaneous emission (ASE).

14 A method of determining an optical signal to noise ratio for an optical channel radiation having a central wavelength λc and having a noise component having a noise wavelength band and a signal component having a signal wavelength band wherein the signal wavelength band is narrower than the noise wavelength band, said method comprising steps of:

providing a fiber grating disposed to receive the optical channel radiation for reflecting or deflecting the signal component out of the fiber grating to form a tapped radiation, and for transmitting at least a portion of the noise component therethrough to form a transmitted radiation;

providing a first optical detector disposed to receive at least a fraction of the tapped radiation for producing a first electrical signal indicative of the signal component;

providing a second optical detector disposed to receive at least a fraction of the transmitted radiation for producing a second electrical signal indicative of the noise component;

providing optical coupling means for coupling the at least a fraction of the tapped radiation into the first optical detector;

providing processing means disposed to receive the first electrical signal indicative of the signal component and the second electrical signal indicative of the noise component for determining the optical signal to noise ratio;

launching a portion of the optical channel radiation into the fiber grating;

determining the optical signal to noise ratio from the first information signal and the second information signal using the processing means.

15 A method of determining the optical signal to noise ratio for an optical channel radiation as defined in claim 14, wherein the step of determining includes a step of calculating a suitable scaled ratio of the first electrical signal and the second electrical signal.

16 A method of determining the optical signal to noise ratio for an optical channel radiation as defined in claim 14, further comprising a step of providing a look-up table for determining the optical signal to noise ratio from the first information signal and the second information signal.

17 A method of determining an optical signal to noise ratio for an optical channel of a WDM signal comprising a plurality of optical channels, said optical channel having a central wavelength λc and having a noise component having a noise wavelength band and a signal component having a signal wavelength band wherein the signal wavelength band is narrower than the noise wavelength band, said method comprising steps of:
providing a wavelength de-multiplexer disposed to receive a fraction of the WDM signal for wavelength de-multiplexing of at least the optical channel from the plurality of optical channels;
determining the optical signal to noise ratio for the optical channel using the method of determining the optical signal to noise ratio as defined in claim 14.

18 An apparatus for measuring an optical signal to noise ratio (OSNR) for an optical channel radiation having a central wavelength λc and having a noise component having a noise bandwidth and a signal component having a signal bandwidth, said apparatus consisting of a fiber Bragg grating having a reflecting bandwidth disposed to receive the optical channel radiation for reflecting at least a portion of the signal component to form reflected radiation, and for transmitting at least a portion of the noise component to form transmitted radiation;
a first optical detector disposed to receive at least a fraction of the reflected radiation for producing a first information signal indicative of the signal component;
a second optical detector disposed to receive the transmitted radiation for producing a second information signal indicative of the noise component;
optical coupling means for coupling the optical channel radiation into the spectrally-selective reflecting element, for coupling at least a fraction of the reflected radiation into the first optical detector, and for coupling the transmitted radiation into the second optical detector;

processing means disposed to receive the first information signal indicative of the signal component and the second information signal indicative of the noise component for determining the optical signal to noise ratio.

19 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the fiber Bragg grating is a tunable fiber Bragg grating operable to reflect a signal component for a plurality of optical channels at different instances of time.

20 An apparatus for measuring the optical signal to noise ratio as defined in claim 2, wherein the processing means are for determining the optical power of the signal component from the first information signal and the second information signal using pre-determined calibration data.